WHAT IS CLAIMED IS:

1.   An apparatus for interworking between heterogeneous No. 7 signaling networks, comprising:

a plurality of signaling network processing units corresponding to heterogeneous No. 7 signaling networks, each configured to interwork with each other in a one-to-one manner, and each configured to execute a signaling network management function and a signaling message handling function for a corresponding signaling network; and

a cross-routing controlling unit coupled between the plurality of signaling network processing units and configured to store network management information of each signaling network transmitted from each of the plurality of signaling network processing units and configured to cross-route a signaling message between the plurality of signaling network processing units based on the stored network management information.

2.   The apparatus of claim 1, wherein each of the plurality of signaling network processing units each comprises:

a signaling network management unit to perform network management for a corresponding signaling network and transmit a state of each signaling point

5   corresponding to the signaling network to the cross-routing controlling unit; and

a signaling message handling unit to transmit the signaling message to be cross-routed from a corresponding current signaling network to the cross-routing controlling unit, and route the signaling message transmitted from the cross-routing controlling unit to a corresponding destination signaling network.

3.   The apparatus of claim 2, wherein the signaling message handling unit comprises:

a message discrimination unit to determine whether the destination signaling point of the signaling message is a current signaling point;

a message distribution unit to distribute the signaling message to a corresponding local message transfer part (MTP) user part in the current signaling point, if the destination signaling point of the signaling message is the current signaling point; and

a message routing unit to request that the signaling message be cross-routed

10   to a heterogeneous signaling network, if the destination signaling point of the signaling message is not the current signaling point and does not exist in the corresponding current signaling network.

4.   The apparatus of claim 3, wherein the message routing unit routes the signaling message to the corresponding signaling network if it receives the signaling message routed by the cross-routing unit, and if the destination signaling point of the received signaling message is contained in the corresponding signaling network and is accessible, and otherwise the message routing unit routes the signaling message to the corresponding destination signaling point.

5.   The apparatus of claim 1, wherein the signaling network processing unit performs functions of a message transfer part (MTP) protocol, and the cross-routing controlling unit performs functions of a MTP user part protocol for the signaling network processing unit, among No. 7 protocols.

6.   The apparatus of claim 1, wherein the cross-routing controlling unit routes the signaling message to the signaling network processing unit of a destination signaling network in accordance with the status information of the signaling point transmitted from each signaling network processing unit.

7.   A method of interworking between heterogeneous No. 7 signaling networks, comprising:

receiving status information of signaling points for each of a plurality of

signaling networks from signaling network processing units separated according to the

type of a signaling network to manage a status of the plurality of signaling networks;

requesting cross-routing of a received signaling message to a heterogeneous

signaling network, if the destination signaling point of the signaling message is not

contained in a homogeneous signaling network; and

cross-routing the signaling message to a destination signaling network if it

is determined that cross-routing is possible based on the status information of the

destination signaling point.

8.   The method of claim 7, wherein managing the status of the plurality of

networks comprises:

receiving a message transfer part (MTP) primitive representing the status

information of a signaling point of a corresponding signaling network;

determining that the status of the signaling point of the corresponding

signaling network is accessible if the MTP primitive is a MTP-RESUME primitive

representing that a signaling message can be transferred to a corresponding signaling

point;

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determining that the status of the signaling point is inaccessible if the MTP primitive is a MTP-PAUSE primitive representing that a signaling message cannot be transferred to the corresponding signaling point; and

determining that the status of the signaling point is congested if the MTP primitive is a MTP-STATUS primitive representing that congestion has occurred in the corresponding signaling point.

9. The method of claim 8, wherein the MTP primitive is received from a signaling network management unit of a signal network processing unit.

10. The method of claim 7, wherein requesting cross-routing comprises:

determining whether cross-routing of the signaling message to heterogeneous signaling networks is possible, if the destination signaling point of the signaling message received from the corresponding signaling network is not contained in an originating signaling network;

transferring the signaling message to a cross-routing unit to perform cross-routing of the signaling message between heterogeneous signaling networks, if the cross-routing of the signaling message is possible; and

removing the signaling message and prohibiting the transfer of the signaling

message to the corresponding destination signaling point, if the cross-routing of the

signaling message is not possible.

11.   The method of claim 10, wherein the transfer of the signaling message is

carried out using a MTP-TRANSFER indication primitive.

12.   The method of claim 10, wherein determining whether cross-routing is

possible comprises:

storing information of signaling points of each signaling network capable

of cross-routing a signaling message between heterogeneous signaling networks;

determining that the cross-routing of the corresponding signaling message

is possible if the destination signaling point of the corresponding signaling message

corresponds to one of the stored signaling points; and

determining that the cross-routing of the corresponding signaling message

is not possible if the destination signaling point of the corresponding signaling message

does not correspond to one of the stored signaling points.

13.   The method of claim 7, wherein the cross-routing comprises:

determining whether the destination signaling point of the signaling message exists;

determining whether the destination signaling point is accessible, if the destination signaling point exists; and

cross-routing the signaling message to the signaling network processing unit of the signaling network to which the destination signaling point belongs if the destination signaling point is accessible.

14. The method of claim 13, wherein the determination of whether the destination signaling point is accessible is based on the status information of each signaling point received from each of the plurality of signaling networks.

15. The method of claim 13, wherein the cross-routing step further comprises removing the signaling message and prohibiting the transfer of the signaling message to the corresponding destination signaling point if the destination signaling point or if the destination signaling point of the signaling message is not accessible.

16. The method of claim 13, wherein the cross-routing of the signaling message is carried out using a MTP-TRANSFER request primitive.

17. A system for interworking heterogeneous No. 7 signaling networks, comprising:

first and second signal network processing units, each coupled to a corresponding heterogeneous No. 7 signaling network; and

a cross-routing control unit coupled to each of the signal networking processing units, wherein the cross-routing control unit stores network management information received from the first and second signal network processing units and performs cross-routing of a signaling message from the first signal network processing unit to the second signal network processing unit.

18. The system of claim 17, wherein the cross-routing control unit receives a MTP-transfer primitive from the first signal network processing unit, which indicates that a signaling message needs to be transferred from the first signaling network to the second signaling network, determines whether a signaling point of the second signaling point is accessible, and cross-routes the signaling message from the first signaling network to the second signaling network if the destination signaling point is accessible.

19. The system of claim 17, wherein the cross-routing control unit receives a first MTP primitive, which represents status information of a first signaling point of the first signal network, receives a second MTP primitive, which represents status

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information of a second signaling point of the second signaling network, determines a type the MTP primitive received from each of the first and second signaling points, and determines a status of each of the first and second singling points based on the type of MTP primitive received from the corresponding signaling point to manage the status of each of the signaling points.

20.   The system of claim 17, wherein each of a first and second signaling point associated with the first and second network processing units, respectively, request cross-routing of a signaling message by determining if a destination signaling point exists in the requesting signaling network, determining whether cross-routing of the signaling message to the destination signaling network is possible, and transmitting the signaling message to the cross-routing control unit using a MTP-transfer indication primitive.

21.   The system of claim 17, wherein each of the first and second signal network processing units comprises:

a signaling network management unit to perform network management for a corresponding signaling network and transmit a state of each signaling point corresponding to the signaling network to the cross-routing controlling unit; and

a signaling message handling unit to transmit the signaling message to be cross-routed from a corresponding current signaling network to the cross-routing

controlling unit, and route the signaling message transmitted from the cross-routing controlling unit to a corresponding destination signaling network.

22.   The system of claim 21, wherein the signaling message handling unit comprises:

a message discrimination unit to determine whether the destination signaling point of the signaling message is a current signaling point;

a message distribution unit to distribute the signaling message to a corresponding local message transfer part (MTP) user part in the current signaling point, if the destination signaling point of the signaling message is the current signaling point; and

a message routing unit to request that the signaling message be cross-routed to a heterogeneous signaling network, if the destination signaling point of the signaling message is not the current signaling point and does not exist in the corresponding current signaling network.

23.   The system of claim 22, wherein the message routing unit routes the signaling message to the corresponding signaling network if it receives the signaling message routed by the cross-routing unit, and if the destination signaling point of the received signaling message is contained in the corresponding signaling network and is

5   accessible, and otherwise the message routing unit routes the signaling message to the

corresponding destination signaling point.

24.   A method of managing a status of signaling points for interworking between

heterogeneous No. 7 signaling networks, comprising:

receiving a MTP primitive representing status information of a first signaling

point;

receiving a MTP primitive representing status information of a second

signaling point;

determining a type of the MTP primitive received from each of the first and

second signaling points; and

determining a status of each of the first and second singling points based on

the type of MTP primitive received from the corresponding signaling point.

25.   The method of claim 24, wherein the type of the MTP primitive is one of

MTP-RESUME, MTP-PAUSE, and MTP-CONGESTION, and wherein MTP-RESUME

indicates that a signaling message can be transferred to the corresponding signaling point,

MTP-PAUSE indicates that the signaling message cannot be transferred to the

5   corresponding signaling point, and MTP-CONGESTION indicates that the

corresponding signaling point is congested.

26. A method of requesting cross-routing of a signaling message between heterogeneous No. 7 signaling networks, comprising:

receiving a signaling message for a destination signaling point from a first signaling network;

determining if the destination signaling point exists in the first signaling network;

determining whether cross-routing of the signaling message to a second signaling network is possible if the destination signaling point does not exist in the first network; and

transmitting the signaling message to a cross-routing controller using the MTP-transfer indication primitive if cross-routing is possible.

27. The method of claim 26, wherein the destination signaling point exists in the first signaling network, then cross-routing is not performed, and it is determined whether the destination signaling point is accessible, and the signaling message is routed to the corresponding signaling network.

28. The method of claim 26, wherein if cross-routing is not possible, then the signaling message is discarded and transfer of the signaling message is prohibited.

29. The method of claim 26, wherein the cross-routing controller, upon receiving the MTP-transfer indication primitive, determines whether the destination signaling point exists, determines whether the destination signaling point is accessible if the destination signaling point exists, and cross-routes the signaling message from the first signaling network to the destination signaling point if the destination signaling point is accessible.

30. A method cross-routing a signaling message between signaling points in a heterogeneous No. 7 signaling network, comprising:

receiving a MTP-transfer primitive from a first signaling point indicating that a signaling message needs to be transferred from the first signaling point to a destination signaling point;

determining whether the destination signaling point exists;

determining whether the destination signaling point is accessible if the destination signaling point exists; and

cross-routing the signaling message from the first signaling point to the destination signaling point if the destination signaling point is accessible.

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31.   The method of claim 30, wherein the signaling message is discarded and the

transfer of the signaling message is prohibited if the destination signaling point does not

exist or if the destination signaling point is not accessible.

32.   The method of claim 30, further comprising receiving a MTP primitive

representing status information of the first signaling point;

        receiving a MTP primitive representing status information of the destination

signaling point; and

        determining an accessibility status of the first signaling point and the

destination signaling point based on a type of the received MTP primitive received from

the corresponding signaling point.